



SEQUENCE LISTING

<110> Board of Regents, The University of Texas System
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<120> BEAD BOUND COMBINATORIAL OLIGONUCLEOSIDE PHOSPHOROTHIOATE AND
PHOSPHORODITHIOATE APTAMER LIBRARIES

<130> UTMB:1024

<140> US 10/828,935
<141> 2004-04-21

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<151> 2002-10-16

<150> US 60/272,509
<151> 2001-11-15

<160> 70

<170> PatentIn version 3.3

<210> 1
<211> 15
<212> DNA
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<220>
<223> Synthetic oligonucleotide.

<220>
<221> misc_feature
<223> Description of Artificial Sequence: synthetic oligonucleotide

<400> 1
ggatccggtg gtctg 15

<210> 2
<211> 15
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> misc_feature
<223> Description of Artificial Sequence: synthetic oligonucleotide

<400> 2
cctactcgcg aattc 15

<210> 3
 <211> 23
 <212> DNA
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 <220>
 <223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate

 <220>
 <221> modified_base
 <222> (1)..(23)
 <223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23.

 <400> 3
 cagttgaggg gactttccca ggc 23

 <210> 4
 <211> 23
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> modified_base
 <222> (1)..(23)
 <223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23.

 <400> 4
 cctgcacatc tcaggatgac ttt 23

 <210> 5
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> modified_base
 <222> (1)..(22)
 <223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 4, 8, 9, 16, 19.

 <400> 5
 atgtagccag ctagtctgtc ag 22

<210> 6
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> modified_base
<222> (1)..(22)
<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 5, 9, 10, 16, 19.

<400> 6
cgcccagtga aggtggaacc cc 22

<210> 7
<211> 50
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> misc_feature
<223> Description of Artificial Sequence: synthetic oligonucleotide

<400> 7
atgcctactc gcgaattccc aggagattcc acggatccgg tggctctgttc 50

<210> 8
<211> 52
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> misc_feature
<223> Description of Artificial Sequence: synthetic oligonucleotide

<400> 8
cctactcgcg aattcagttg aggggacttt cccaggcgga tccggtggtc tg 52

<210> 9
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
 <221> misc_feature
 <223> Description of Artificial Sequence: consensus sequence

 <400> 9
 atgcctactc gcgaattc 18

<210> 10
 <211> 18
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

<220>
 <221> misc_feature
 <223> Description of Artificial Sequence: synthetic oligonucleotide

 <400> 10
 gaacagacca ccgatcc 18

<210> 11
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

<220>
 <221> misc_feature
 <223> Description of Artificial Sequence: synthetic oligonucleotide

 <400> 11
 ctgtgagtcg actgatgacg gt 22

<210> 12
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

<220>
 <221> misc_feature
 <223> Description of Artificial Sequence: synthetic oligonucleotide

 <400> 12
 agttgagtcg aaggacccat tt 22

<210> 13
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> misc_feature
 <223> Description of Artificial Sequence: synthetic oligonucleotide

 <400> 13
 cgtcaagtct cagttcccat tt 22

 <210> 14
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> misc_feature
 <223> Description of Artificial Sequence: synthetic oligonucleotide

 <400> 14
 agtcaagtcg aagttccacg gt 22

 <210> 15
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> modified_base
 <222> (1)..(22)
 <223> wherein at least one nucleotide is an achiral thiophosphate or
 dithiophosphate at positions 2, 8, 14, 16, 22.

 <400> 15
 ctgtgagtcg actgatgacg gt 22

 <210> 16
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>

<223> Synthetic oligonucleotide.

<220>

<221> modified_base

<222> (1)..(22)

<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 8, 12, 14, 20, 22.

<400> 16

agttgagtcg aaggacccat tt

22

<210> 17

<211> 22

<212> DNA

<213> Artificial

<220>

<223> Synthetic oligonucleotide.

<220>

<221> modified_base

<222> (1)..(22)

<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 4, 8, 10, 12, 20, 22.

<400> 17

cgtcaagtct cagttcccat tt

22

<210> 18

<211> 22

<212> DNA

<213> Artificial Sequence

<220>

<223> Synthetic oligonucleotide.

<220>

<221> modified_base

<222> (1)..(22)

<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 4, 8, 12, 18, 22.

<400> 18

agtcaagtcg aagttccacg gt

22

<210> 19

<211> 22

<212> DNA

<213> Artificial Sequence

<220>

<223> Artificial oligonucleotide.

<220>
<221> misc_feature
<223> Description of Artificial Sequence: synthetic oligonucleotide

<400> 19
atgtagccag ctagtctgtc ag 22

<210> 20
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> misc_feature
<223> Description of Artificial Sequence: synthetic oligonucleotide

<400> 20
cgccagccaa aggtgctgtc ag 22

<210> 21
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> misc_feature
<223> Description of Artificial Sequence: synthetic oligonucleotide

<400> 21
cgcccagtggt ctagtgaacc cc 22

<210> 22
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> misc_feature
<223> Description of Artificial Sequence: synthetic oligonucleotide

<400> 22
atgtagccga aggtggaacc cc 22

<210> 23

<211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> misc_feature
 <223> Description of Artificial Sequence: synthetic oligonucleotide

 <400> 23
 cgccagccga aggtggaacc cc 22

 <210> 24
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> misc_feature
 <223> Description of Artificial Sequence: synthetic oligonucleotide

 <400> 24
 atgtagccag ctagtctgtc ag 22

 <210> 25
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> modified_base
 <222> (1)..(22)
 <223> wherein at least one nucleotide is an achiral thiophosphate or
 dithiophosphate at positions 10.

 <400> 25
 cgccagccaa aggtgctgtc ag 22

 <210> 26
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

<220>
 <221> modified_base
 <222> (1)..(22)
 <223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 5, 9, 16, 17.

 <400> 26
 cgcccagtggtg ctagtgaacc cc 22

 <210> 27
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> modified_base
 <222> (1)..(22)
 <223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 9, 10, 16, 17.

 <400> 27
 atgtagccga aggtggaacc cc 22

 <210> 28
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> modified_base
 <222> (1)..(22)
 <223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 10, 11, 17, 18.

 <400> 28
 cgccagccga aggtggaacc cc 22

 <210> 29
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> misc_feature

<223> Description of Artificial Sequence: synthetic oligonucleotide

<400> 29
 ggggttcac cttcactggg cg 22

<210> 30
 <211> 22
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Synthetic oligonucleotide.

<220>
 <221> misc_feature
 <223> Description of Artificial Sequence: synthetic oligonucleotide

<400> 30
 cccaaggtg gaagtgaccc gc 22

<210> 31
 <211> 22
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Synthetic oligonucleotide.

<220>
 <221> modified_base
 <222> (1)..(22)
 <223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 10.

<400> 31
 cgccagccga aggtgctgtc ag 22

<210> 32
 <211> 22
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Synthetic oligonucleotide.

<220>
 <221> modified_base
 <222> (1)..(22)
 <223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 10, 16, 17.

<400> 32
 atgtagccaa aggtggaacc cc 22

<210> 33
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> modified_base
 <222> (1)..(22)
 <223> wherein at least one nucleotide is an achiral thiophosphate or
 dithiophosphate at positions 5, 9, 10.

 <400> 33
 cgcccagtgagggtgctgtc ag 22

 <210> 34
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> modified_base
 <222> (1)..(22)
 <223> wherein at least one nucleotide is an achiral thiophosphate or
 dithiophosphate at positions 4.

 <400> 34
 cgcccagtagctagtctgtc ag 22

 <210> 35
 <211> 15
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> misc_feature
 <223> Description of Artificial Sequence: synthetic oligonucleotide

 <400> 35
 ggatccggtggtctg 15

 <210> 36
 <211> 15
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Synthetic oligonucleotide.

<220>
 <221> misc_feature
 <223> Description of Artificial Sequence: synthetic oligonucleotide

<400> 36
 cctactcgcg aattc 15

<210> 37
 <211> 14
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Synthetic oligonucleotide.

<220>
 <221> modified_base
 <222> (1)..(14)
 <223> wherein at least one nucleotide is an achiral thiophosphate or
 dithiophosphate at positions 9, 10.

<400> 37
 ccaggagatt ccac 14

<210> 38
 <211> 14
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Synthetic oligonucleotide.

<220>
 <221> modified_base
 <222> (1)..(14)
 <223> wherein at least one nucleotide is an achiral thiophosphate or
 dithiophosphate at positions 3, 13.

<400> 38
 gtggaatctc ctgg 14

<210> 39
 <211> 14
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Synthetic oligonucleotide.

<220>
<221> modified_base
<222> (1)..(14)
<223> wherein at least one nucleotide is an achiral thiophosphate or
dithiophosphate at positions 4, 5, 10, 11.

<400> 39
ccaggagatt ccac 14

<210> 40
<211> 14
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> modified_base
<222> (1)..(14)
<223> wherein at least one nucleotide is an achiral thiophosphate or
dithiophosphate at positions 9, 11, 12.

<400> 40
gtggaatcyc cygg 14

<210> 41
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> modified_base
<222> (1)..(30)
<223> wherein at least one nucleotide is an achiral thiophosphate or
dithiophosphate at position 1.

<400> 41
ccaggagatt ccacggatcc ggtggtctgt 30

<210> 42
<211> 45
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> modified_base
<222> (16)..(16)

<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate.

<400> 42
cctactcgcg aattcccagg agattccacg gatccggtgg tctgt 45

<210> 43
<211> 14
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> modified_base
<222> (1)..(14)
<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 5, 9, 13.

<400> 43
ccagtgactc agtg 14

<210> 44
<211> 14
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> modified_base
<222> (1)..(14)
<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 4, 8, 12,

<400> 44
ggtcactgag tcac 14

<210> 45
<211> 14
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> modified_base
<222> (1)..(14)
<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 10, 11.

<400> 45
ccaggagatt ccac 14

<210> 46
<211> 14
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> modified_base
<222> (1)..(14)
<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 4, 7, 9, 14.

<400> 46
ggtcctctaa ggtg 14

<210> 47
<211> 14
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> modified_base
<222> (1)..(14)
<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 10, 11.

<400> 47
ccaggagatt ccac 14

<210> 48
<211> 14
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> modified_base
<222> (1)..(14)
<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 4, 7, 9, 14.

<400> 48
ggtcctctaa ggtg 14

<210> 49
 <211> 24
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> misc_feature
 <223> Description of artificial sequence: synthetic oligonucleotide

 <400> 49
 agttgagggg actttcccag gctt 24

 <210> 50
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> misc_feature
 <223> Description of artificial sequence: synthetic oligonucleotide

 <400> 50
 gcctgggaaa gtcccctcaa ct 22

 <210> 51
 <211> 14
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> modified_base
 <222> (1)..(14)
 <223> wherein at least one nucleotide is an achiral thiophosphate or
 dithiophosphate at positions 10, 11.

 <400> 51
 ccaggagatt ccac 14

 <210> 52
 <211> 14
 <212> DNA
 <213> Artificial Sequence

 <220>

<223> Synthetic oligonucleotide.

<220>

<221> modified_base

<222> (1)..(14)

<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 3, 7, 9, 13.

<400> 52

gtggaatctc ctgg

14

<210> 53

<211> 22

<212> DNA

<213> Artificial Sequence

<220>

<223> Synthetic oligonucleotide.

<220>

<221> modified_base

<222> (1)..(22)

<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 6, 10, 11, 17, 18

<400> 53

cgcccagtga aggtggaacc cc

22

<210> 54

<211> 22

<212> DNA

<213> Artificial Sequence

<220>

<223> Synthetic oligonucleotide.

<220>

<221> modified_base

<222> (1)..(22)

<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 9, 15.

<400> 54

ggggttccac cttcactggg cg

22

<210> 55

<211> 22

<212> DNA

<213> Artificial Sequence

<220>

<223> Synthetic oligonucleotide.

<220>
<221> modified_base
<222> (1)..(22)
<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 6, 10, 18.

<400> 55
cgcccaagtga aggtggaacc cc 22

<210> 56
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> modified_base
<222> (1)..(22)
<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 9, 15.

<400> 56
gggggttcac cttcactggg cg 22

<210> 57
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> modified_base
<222> (1)..(22)
<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 6, 18.

<400> 57
cgcccaagtga aggtggaacc cc 22

<210> 58
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> modified_base
<222> (1)..(22)

<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 9, 15.

<400> 58
ggggttccac cttcactggg cg 22

<210> 59
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> modified_base
<222> (1)..(22)
<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 6, 11, 12, 18, 19.

<400> 59
cgcccagtga aggtggaacc cc 22

<210> 60
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> misc_feature
<223> Description of artificial sequence: synthetic oligonucleotide

<400> 60
ggggttccac cttcactggg cg 22

<210> 61
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic oligonucleotide.

<220>
<221> modified_base
<222> (1)..(22)
<223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 6, 10, 18.

<400> 61
cgcccagtga aggtggaacc cc 22

<210> 62
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> misc_feature
 <223> Description of artificial sequence: synthetic oligonucleotide

 <400> 62
 ggggttcac cttcactggg cg 22

 <210> 63
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> modified_base
 <222> (1)..(22)
 <223> wherein at least one nucleotide is an achiral thiophosphate or
 dithiophosphate at positions 6, 18.

 <400> 63
 cgcccagtga aggtggaacc cc 22

 <210> 64
 <211> 22
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Synthetic oligonucleotide.

 <220>
 <221> misc_feature
 <223> Description of artificial sequence: synthetic oligonucleotide

 <400> 64
 ggggttcac cttcactggg cg 22

 <210> 65
 <211> 22
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Synthetic oligonucleotide.

<220>
 <221> misc_feature
 <223> Description of artificial sequence: synthetic oligonucleotide

<400> 65
 cgcccagtga aggtggaacc cc 22

<210> 66
 <211> 22
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Synthetic oligonucleotide.

<220>
 <221> modified_base
 <222> (1)..(22)
 <223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 9, 15.

<400> 66
 ggggttcac cttcactggg cg 22

<210> 67
 <211> 31
 <212> RNA
 <213> Artificial Sequence

<220>
 <223> Artificial oligonucleotide.

<220>
 <221> modified_base
 <222> (1)..(31)
 <223> wherein at least one nucleotide is an achiral thiophosphate or dithiophosphate at positions 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 19, 31, 33.

<400> 67
 gauccugaaa cuguuuuaag guuggccgau c 31

<210> 68
 <211> 31
 <212> RNA
 <213> Artificial Sequence

<220>
 <223> Artificial oligonucleotide.

<220>
 <221> modified_base
 <222> (1)..(31)
 <223> wherein at least one nucleotide is an achiral thiophosphate or
 dithiophosphate at positions 3, 5, 7, 9, 11, 13, 15, 17, 19, 21,
 23, 25, 27, 29, 31.

<400> 68
 cuaggacuug gcacaaccgu cacacugcua u 31

<210> 69
 <211> 61
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Artificial oligonucleotide.

<220>
 <221> modified_base
 <222> (1)..(61)
 <223> wherein at least one nucleotide is an achiral thiophosphate or
 dithiophosphate at positions 3, 5, 7, 9, 11, 13, 15, 17, 19, 21,
 23, 25, 27, 29, 31.

<400> 69
 cctactcgcg aattccuagg acuuggcaca accgucacac ugcuaaggat ccggtggtct 60
 g 61

<210> 70
 <211> 61
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Artificial oligonucleotide.

<220>
 <221> modified_base
 <222> (1)..(61)
 <223> wherein at least one nucleotide is an achiral thiophosphate or
 dithiophosphate at positions 3, 5, 7, 9, 11, 13, 15, 17, 19, 21,
 23, 25, 27, 29, 31.

<400> 70
 cctactcgcg aattcgaucc ugaaacuguu uuaagguugg ccgaucggat ccggtggtct 60
 g 61